

Perceptual Acquisitions of Non-native Syllable Structures by Native Listeners of Japanese

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INTRODUCTION

Perceptual Assimilation Model (PAM)

- Adults' perception of non-native contrasts is affected by both native language and non-native language experiences.
- In the Perceptual Assimilation Model (PAM), Non-native discriminability is predicted by comparing native and non-native phonological systems (Best, 1995).

Japanese syllable structures

- Basic Japanese syllable structure is CV. (Shibatani, 1990)
 - Unlike English, coda consonants are not allowed except:
 - Moraic nasal /N/: e.g. *bin* /biN/ 'a bottle'
 - The first element of geminate consonants /Q/ in the middle of word: e.g. *kitte* /kiQte/ (/[kit:ɛ]/) 'a stamp'.
 - Geminate consonants are usually voiceless. Voiced geminate consonants only occur in loan words, but gemination rate of voiced consonants is low, and mostly pronounced as voiceless geminates, e.g. *betto* /beQto/ or /beQdo/ 'bed'. (Shibatani, 1990; Shirai, 1999; Koizumi, 1989)
 - English allows syllable structures that Japanese does not.
- ### Bilabial stops in English and Japanese
- (Lisker & Abramson, 1964; Homma, 1981)
- English /p/ is pronounced with longer VOT than Japanese /p/.
 - English /b/ is usually devoiced and its VOT range overlaps with the VOT range for Japanese /p/.
 - Japanese /p/ has less aspiration than English /p/.
 - In word final position, voicing contrast in English appears in the preceding vowel duration.

RESEARCH QUESTIONS

Perceptual assimilation at suprasegmental level

- Can Japanese listeners identify non-native syllable structures?
- Do Japanese listeners have difficulty with voicing identification in non-native syllables?

Effect of non-native language experience

- Does the degree of English exposure have an influence on listeners' performance?

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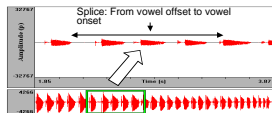
METHODS

Subjects:

- JO* (Monolingual Older Japanese):** 8 older native speakers of Japanese with little ability to communicate in English (Mean age = 51.6).
- JY* (Monolingual Young Japanese):** 12 younger native speakers of Japanese with little ability to communicate in English (Mean age = 19.7).
- *Both JO and JY participated in the experiment in Japan.
- JA (Japanese Advanced learners of English):** 14 native speakers of Japanese who were students of Indiana University at the time of experiment (Mean age = 24.4).
- AE:** 18 native speakers of American English as a control group (Mean age = 20).

Stimuli:

- Four native speakers of American English.
- Repeated syllables for each utterance were either /ip/, /ib/, /ip/, or /ib/.
- Repetition rate started slow (450 ms/σ) and ended fast (200 ms/σ). Rate was controlled with a metronome.
- 21 stimuli were spliced from each original utterance.
- 7 slower stimuli were grouped as *slow rate stimuli*.
- 7 faster stimuli were grouped as *fast rate stimuli*.
- Fast rate stimuli were more ambiguous and considered difficult to identify.
- Total number of stimuli: 336
- Each stimulus contained three syllables.



Tasks:

- Four-alternative forced choice identification (/ip/, /ib/, /ip/, or /bi/)
- 100 % scale confidence rating for identification answers

PREDICTIONS

- If non-native syllable structure VC is assimilated to Japanese syllable with geminates VCCV, it will be perceived as an extremely deviant exemplar of the category. Identification of VC structure will be good. However voicing identification of the final consonant is expected to be poor because /ib/ and /ip/ could be assimilated to a single category of the voiceless geminates.
- Alternatively, if VC is not assimilated to any native categories, VC structure will be uncategorized while CV is categorized as native Japanese category. This will also predict good performance for syllable structure identification. Since the listeners can access the fine phonetic details, voicing identification is also expected to be good.
- Performance will approximate English performance as the listeners exposure to English increases.

RESULTS

Non-native syllable perception

- Japanese listeners can identify the non-native syllable structure VC (/ip/ & /ib/ stimuli) when speech rate is slow.
- JY exhibited a bias toward VC for CV stimuli.
- Despite their accuracy, monolingual Japanese (JY & JO) exhibited uncertainty about their answers.

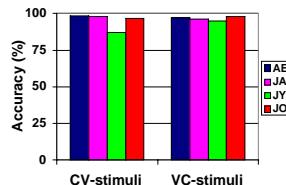


FIG 1. Mean correct identification of the syllable structures averaged over the 7 slow rate stimuli

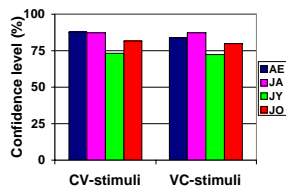


FIG 2. Mean confidence rates of the four listener groups averaged over the 7 slow rate stimuli

- Fast VC-stimuli were perceived as CV due to perceptual resyllabification effect (Lim et al, 2002), but this effect is stronger for Japanese listeners (except JY).

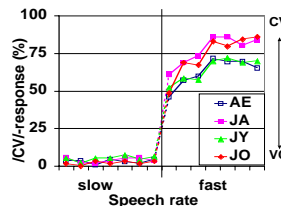


FIG 3. Mean CV responses for VC-stimuli at slow and fast stimuli.

Non-native voicing perception

- Japanese listeners tend to perceive /b/ as /p/ as predicted by the VOT distributions.
- Bias toward /p/-responses is weaker for JA group than the other two monolingual groups JY and JO.

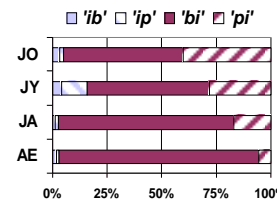


FIG 4. Response distributions to slow rate /bi/ stimuli.

- Voicing identification was good for most non-native /ib/-stimuli for all the Japanese groups. A weak tendency toward voiceless responses was found in JA and JO.

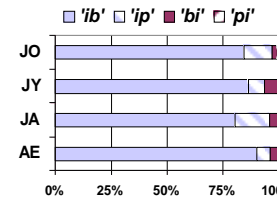


FIG 5. Response distributions to slow rate /ib/ stimuli.

- Voicing identification for /ip/-stimuli was poor for JO, while better voicing identification was found in JY and JA.

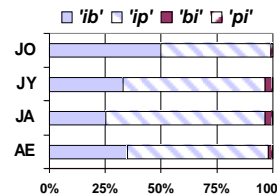


FIG 6. Response distributions to slow rate /ip/ stimuli.

- JY seemed to identify syllables by analysing phonetic details phoneme by phoneme when the stimuli became faster, /pi/ as /pi/ or /ip/.

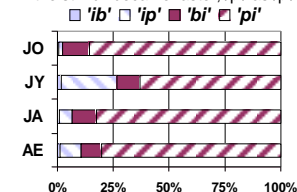


FIG 7. Response distributions of fast rate /pi/-stimuli.

SUMMARY

- The non-native syllable structure was correctly identified by the Japanese listeners.
- However, native language experiences produced a bias on syllable structure perception and voicing perception.
- Non-native language experience had positive effects on both voicing and syllable structure perception accuracy.
- Native language effects appeared more clearly as the speech rate becomes fast.
- The non-native syllable structure was perceived as an uncategorized category for the listeners without English exposure.
- A bias toward a non-native VC category can be seen in the less experienced non-native listeners, but persistent phonemic categorization from the native language also existed.
- PAM can be applied to second language acquisition at prosodic level.

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